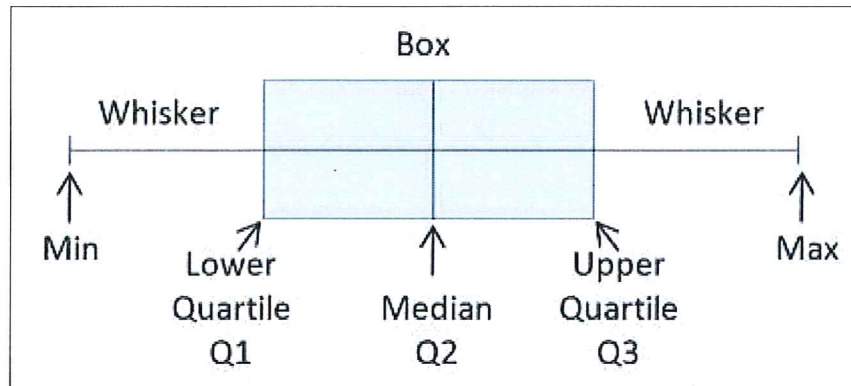


Quartiles, Interquartile Range, and Box-and-Whisker Plot



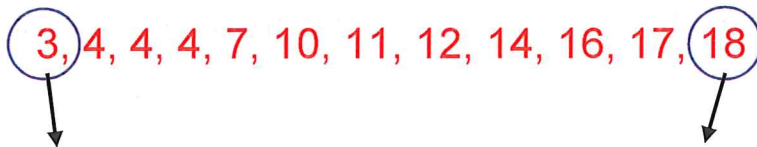
Example:

4, 17, 7, 14, 18, 12, 3, 16, 10, 4, 4, 11

1. Put them in order from least to greatest

3, 4, 4, 4, 7, 10, 11, 12, 14, 16, 17, 18

2. After putting the numbers in order, find the smallest number (Min) and the largest number (Max).



Min=3

Max=18

3. Find the median (Q2).

~~3~~, ~~4~~, ~~4~~, ~~4~~, ~~7~~, (10, 11), ~~12~~, ~~14~~, ~~16~~, ~~17~~, ~~18~~

If the median is one number, then that is your median.

Since there are two numbers in the middle, find the average of the two numbers

$$10+11=21$$

$$21/2= 10.5$$

Median (Q2)= 10.5

4. Find Interquartile 1 (Q1) using the numbers to the left of the median.
Take those numbers and find the median.



5. Find Interquartile 3 (Q3) using the numbers to the right of the median.
Take those numbers and find the median.



6. Collect the numbers you just found to make your box-and-whisker plot.

Min=3

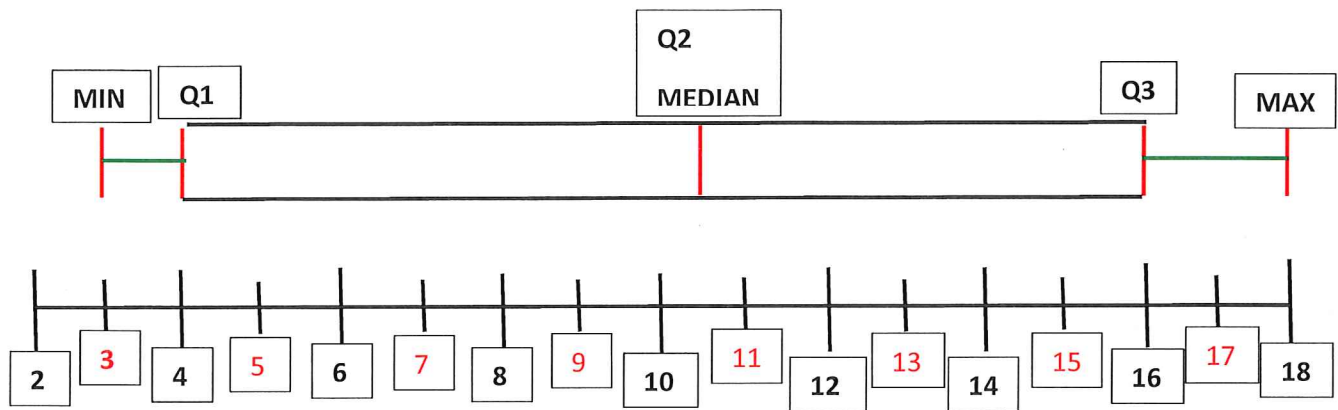
Q1= 4

Median (Q2) =10.5

Q3= 16

Max=18

7. Create a number line; intervals will depend on sample size (for this example, it will have intervals of 2). The black numbers are the interval numbers and the red numbers are the numbers in between each interval.
8. Plot **each number (Min, Q1, median (Q2), Q3, and Max)**. Then, connect Q1, median (Q2) and Q3 into a box. Make the whiskers by connecting the Min to Q1 and Q3 to the Max.
9. Don't forget to label!



Finding the Interquartile Range (IQR)

$$\text{IQR} = \text{Q3} - \text{Q1}$$

$$\text{Q1} = 4$$

$$\text{Q3} = 16$$

$$16 - 4 = 12$$

$$\text{IQR} = 12$$

Finding Outliers

$$\text{Q1} - 1.5(\text{IQR})$$

$$\text{Q3} + 1.5(\text{IQR})$$

Outliers will be any points below $\text{Q1} - 1.5(\text{IQR})$ or above $\text{Q3} + 1.5(\text{IQR})$.

$$\text{Q1} = 4$$

$$\text{Q3} = 16$$

$$\text{IQR} = 12$$

$$Q1 - 1.5(IQR)$$

$$4 - 1.5(12)$$

$$4 - 18 = -14$$

$$Q3 + 1.5(IQR)$$

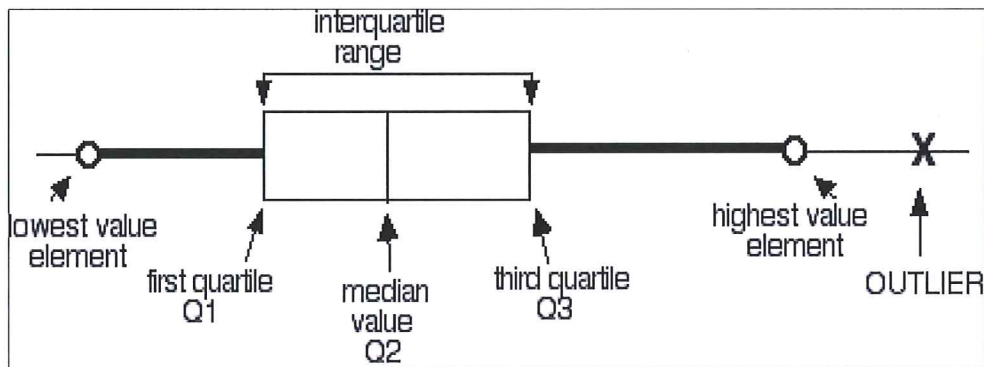
$$16 + 1.5(12)$$

$$16 + 18 = 34$$

Compare these two numbers (-14, 34) to our sample size to see if the example has any outliers.

3, 4, 4, 4, 7, 10, 11, 12, 14, 16, 17, 18

Looking at the sample size and the outliers, there are no outliers in this example.



If the sample size does have outlier(s), then it would look like the picture above. The outlier(s) would not be part of the box-and-whisker plot, it would be a point outside of the box-and-whisker plot.